

Be sure to show all work, use the correct number of significant figures, circle final answers and use correct units in all problems.

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1) Acetic acid ( $\text{CH}_3\text{CO}_2\text{H}$ , 2.00 g) and sodium acetate ( $\text{NaC}_2\text{H}_3\text{O}_2$ , 2.00 g) are dissolved in enough water to make 1.00 L of solution. Calculate the pH of the solution ( $K_a = 1.80 \times 10^{-5}$ ) (6 points)

2) 50.0 mL of 0.150 M acetic acid is being titrated with 0.250 M LiOH. What is the pH at the half-equivalence point? How many mL of LiOH are required to reach the half equivalence point? ( $K_a = 1.80 \times 10^{-5}$ ) (4 points)

3) A solution contains 20.0 mL of 0.150 M  $\text{HNO}_3$ . (10 points)

a) What is the pH of the  $\text{HNO}_3$  solution?

b) What is the pH after 10.0 mL of 0.250 M NaOH has been added?

c) What is the pH at the equivalence point? How many mL of 0.250 M NaOH need to be added to reach the equivalence point?

d) What is the pH after 30.0 mL of 0.250 M NaOH have been added?